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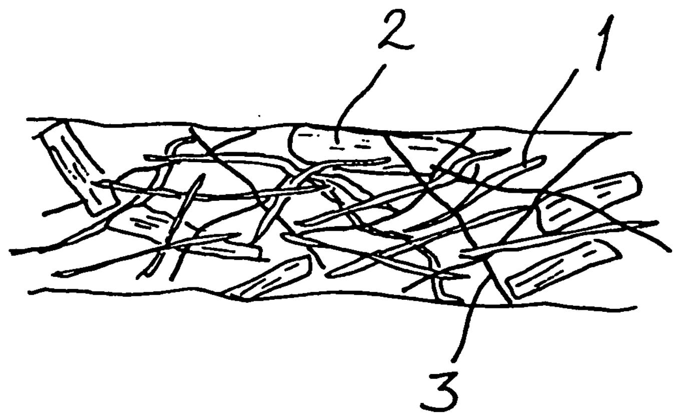
(57) Abstract

A fibre product manufactured of flax or a corresponding stem fibre plant constitutes a structural element containing both actual fibres (1) of the stalk and wood splinters or shives (2) originating from the same plant raw material and incorporated in the product by crushing the structure of the stalk to a sufficient degree. The product can be a pressed-to-shape structural element or a porous product, such as an insulating material or a cultivation substrate. The method comprises the following steps: a) mechanical crushing of stalks, b) working-up of the crushed stalks between surfaces moving in relation to each other so that the fibres and wood splinters are separated and mixed, c) separating fine particles from the fibres and wood splinters, d) transferring the fibres and wood splinters with a medium to a forming platform.



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Fibre product, method and apparatus for manufacturing a fibre product

The invention relates to a fibre product presented in the introductory part of the appended Claim 1, as well as to a method presented in the introductory part of the appended Claim 6 and to an apparatus for manufacturing a fibre product presented in Claim 13.

Flax, *Linum usitatissimum*, is a commonly cultivated plant in Europe, and the use of flax fibre has been known for a long time past, although its present share is relatively small of the total vegetable fibre production in the world. Flax is cultivated primarily in Russia, Poland, Lithuania, France, Belgium, the Netherlands, and also in Finland, even though the area presently under cultivation there is relatively small. Flax is a natural fibre plant belonging to the group of so-called stem fibre plants.

Flax fibres (linen) have been so far used as raw materials for textile products, either alone or in combination with other fibres. Flax fibres have good strength, but poor elasticity; for example, they are stiffer than cotton fibres. Because of the fibre properties, they are primarily used in textiles for the household or for interior decoration, such as towels and table cloths, as well as curtains and other interior decoration fabrics.

When flax is used for textile manufacturing, the fibres are spun into a yarn which can be used for manufacturing woven textile products. The separation of textile fibres from harvested flax plant is a process of several steps, including retting, drying, breaking, scutching, and hackling. The result is a pure fibre, from which the other parts of the stalk have been separated. These steps were previously carried out manually but presently by machine. Examples of apparatuses for flax processing by machine are presented in Finnish patent No. 14276 and in European application publication No. 398 421. Furthermore, German application publication 3 815 771 discloses an apparatus for separating fibres of fibre plants from woody fragments.

The purpose of the invention is to increase the possible uses of flax or other stem fibre plants that are processed in a similar way, and also to increase the area for cultivation of flax which is a plant very suitable for cultivation in northern regions. Another purpose is to present a method in which separate processing steps that are often conducted at different locations will be rendered unnecessary. For achieving this purpose, the product according to the invention is primarily characterized in what will be presented in the characterizing part of the appended Claim 1.

The product incorporates both the ~~actual flax fibres~~ and the wooden splinters, "shives" which have a larger diameter and which have previously been removed in connection with manufacturing the fibre. Both of these components suit well together for products for different uses, such as hard pressed-to-shape pieces resembling primarily chip board, or more fluffy, mat-like products which can be used as insulating materials or cultivation substrates. The stalk parts of flax will be better utilized, *i.e.* the crop of raw material per hectare of cultivated land will increase. If necessary, suitable bond fibres will be used for reinforcing the structure of the product.

Another purpose of the invention is to present a novel method and an apparatus for manufacturing a fibre product. For achieving this purpose, the invention is primarily characterized in what will be presented in the characterizing parts of the appended Claims 6 and 13. For manufacturing the final product, it will be sufficient to crush and treat the stalks mechanically to the extent that the product is sufficiently homogeneous. The formation of the product or prefabricated product into a structure in which the different components are approximately in their final positions in relation to each other, is best conducted with the dry method. Processing the raw material from the stalks into a product in which the elements are mixed with each other in their almost final positions is best conducted in the same continuous processing line, in which the material is carried by conveyors and a conveying medium from the point of feeding in the raw material up to product formation.

In the following, the invention will be described in more detail with reference to the appended drawings, in which

Fig. 1 shows the stalk of flax plant used as the raw material in a cross section,

Fig. 2 shows schematically the structure of the finished product,

Fig. 3 is a general view of the raw material processing line,

Fig. 4 is a side view of the apparatus of step 1 of the processing line,

Fig. 5 is a side view of the apparatus of step 2 of the processing line,

Fig. 6 is a side view of the apparatus of step 3 of the processing line,

Fig. 7 is a side view of the apparatus of step 4 of the processing line, and

Fig. 8 illustrates schematically the principle of product formation.

Figure 1 shows the stalk of flax in a cross section. It comprises an outermost surface layer A which contains chlorophyll, and a soft cortex layer B which contains glue-like pectin and accommodates fibre bundles C extending parallel to the stalk from the root to the top. Inside is the woody part D of the stalk, and innermost is the hollow centre E.

The fibre bundles of the stalk are composed of a large number of small basic fibres which are kept together by pectin. The length of the basic fibre of flax is most commonly about 40—65 mm, and its diameter is in the range of 8—30 µm.

Fig. 2 shows schematically the final product. The product incorporates both fibres 1 originating from fibre bundles C and small wood splinters, "shives" 2 originating from the woody part D of the stalk. These components have been mixed into a three-dimensional structure. The reference numeral 3 indicates synthetic bond fibres, such as thermoplastic fibres, which can be subjected to thermal treatment to form a three-di-

mensional network to which said vegetal components are fixed partly by thermal bonding and which, on the other hand, keeps the components mechanically in position by forming a kind of cage to surround them. The finer material which has been formed of the other parts of the stalk by becoming ground, is separated from the raw materials constituting the final product.

Because flax fibres have poor elasticity, the products are suitable for uses in which no resiliency is required to their original form, *i.e.* for uses as "static" products. These products include pressed-to-shape hard products, such as hat racks of vehicles and ceiling materials. These usually have a density in the range from 600 to 650 kg/m³. On the other hand, the products are suitable for mat-like products with a low density, to be used as insulation materials or particularly as cultivation substrates. Such mat-like products can have a density as low as 20—50 kg/m³. Instead of a mat-like product with an even thickness, it is also possible to manufacture a harder plate having an even thickness (density 350—450 kg/m³) which can be used as insulation or building material. Generally, the density of products can vary from 20 to 650 kg/m³.

Figure 3 shows schematically the beginning of the production line. The method for manufacturing of an at least semi-fabricated or intermediate product comprises the following steps:

a) mechanical crushing of stalks,
b) working up of the crushed stalks between surfaces moving in relation to each other so that the fibres and wood splinters are separated and mixed,
c) separating fine particles from the fibres and wood splinters,
d) transferring the fibres and wood splinters with a medium to a forming platform to form at least a pre-fabricated or intermediate product incorporating fibres and wood splinters in the same structure.

Figure 3 shows the beginning of the production line, *i.e.* the pre-treatment section before transferring the raw material of the product onto the forming platform. Step 1 (V1) comprises an opening apparatus and

a working apparatus, step 2 (V2) comprises a metering apparatus, step 3 (V3) comprises a mixing and separating apparatus, and step 4 (V4) comprises a levelling apparatus.

In the opening apparatus shown in Fig. 4, the raw material, flax from which the seed-vessels have been removed, is supplied in dry bales or large bundles. The opening apparatus comprises a spiked belt 4 running in an upwards slanted direction, above which there is a horizontal spiked belt 5 running in the opposite direction and preventing the large stalk bundles from slipping from the gap between the conveyors. The upper end of the loop of the slanted belt 4 is followed by a feeding roll 6 for dropping the sufficiently opened bundles onto a conveyor 7. At the point between the belts 4 and 5, the stalks are already crushed to some extent. The crushed stalks are carried by the conveyor 7 to the feeding device 8 of the actual treatment and separating apparatus. The feeding device consists of successive pairs of rollers, wherein the stalks are fed in through a gap between the spiked rollers that are situated on top of each other in the pairs of rollers forward towards the surface of a large, fast rotating drum 9 whose peripheral speed can exceed 1000 m/min. The drum is equipped with protrusions which take up crushed stalks. The periphery of the drum 9 carries stalks through narrow gaps which are formed between the spiked rollers 10, 11, 12 placed along the periphery of the drum and the peripheral surface of the drum. The spiked rollers rotate all in the same direction which is opposite to the rotation direction of the drum, wherein the direction of movement of opposite surfaces in the gaps is the same. The relative movement of the protrusions of the drum and the rollers is caused by the smaller surface velocities of the rollers, in the order of 30 to 100 m/min, wherein the movement of the protrusions of the rollers and the drum in the gaps brings about rubbing of the stalks and separation of the fibre bundles and the woody part of the stalk from each other, and breaking down of the woody parts into small wood splinters or shives. By effect of mechanical working caused by the fast moving surfaces of the drum and rollers, the other parts of the stalk are ground into finer particles which can be removed later on. The gaps between the rollers and the drum are decreased in the running direction of the periphery of the drum, and the distances between the tips of the protrusions in the gaps can be less than 2 mm.

After the material has passed along the periphery of the drum 9 through the successive gaps formed by the drum and the opposite rollers, the material enters a point where it is caught up by an air flow led through a channel 13. This air flow will now contain the separated fibres and wood splinters which are mixed relatively well with each other, as well as the finer ground material among them.

Figure 5 shows a metering apparatus. The fibres sucked in through the channel 13 are blown to the upper part of a metering silo. In the lower part of the silo, there is a set of rollers 15 for metering the material to a conveyor 16 running underneath them. This apparatus is also used for metering the other fibre material to the production line via a second metering silo 17, the fibre material being supplied to its upper part. The other fibre material consists preferably of a bond fibre which is a synthetic plastic material, particularly a heat-activated material. For example, thermoplastic fibre, such as polyethylene fibre, are feasible. The bond fibre can be supplied in *e.g.* about 2.5 to 7.5 wt-% on top of the basic material carried on the conveyor 16. The proportion of this blend fibre can be controlled by means of the rotation speed of the rollers in a set of rollers 18 in the lower part of the second metering silo 17. The conveyor 16 carries the basic material and the blend fibres into an apparatus whose structure and operation corresponds to the opening apparatus of Fig. 3 and which comprises a slanted spiked belt 19. This apparatus is used for mixing the basic material and the blend fibres, and simultaneously it opens larger clusters which cannot pass through the gap between the belts in the upper part of the slanted belt.

Figure 6 illustrates the mixing and separating apparatus, in which the basic material (fibres and wood splinters) are further mixed together and with the blend fibres supplied in the previous step. The apparatus has a slanted frame 20 accommodating an upwards slanted transfer line provided with successive pin rollers 21 rotating in the same direction at a high rotational speed (about 300 rpm). The pins 22 are arranged between each other in the space between two successive rollers. Underneath the transfer line formed by the rollers, the frame is provided with a chamber 23 which is connected to suction. The chamber is separated from the pin rollers 21 by curved screen plates 24 at

the rollers, the finer material being sucked through the screen plates 24. The mesh size of the screen plates 24 can be adjusted according to each application. The pin rollers 21 rotate in a direction that next to the screen plates 24 their peripheries move in the direction of the upwards slanted transfer line and throw material against the screen plates by the effect of the centrifugal force. In the space between two successive pin rollers 21, the material brought by the pins 22 of the first roller is transferred to be moved by the next roller by the effect of its pins 22 moving in the opposite direction. If the material is not sufficiently loose, it will be carried with the movement of the first roller against the transfer direction of the transfer line towards its beginning. In this separating apparatus, the finer material, whose proportion is generally 50 %, will be finally separated from the raw material. As a result, the proportion of the previously added blend fibres will be approximately doubled, *i.e.* about 5 to 15 wt-% of the total mass of the product. The proportion of blend fibres can generally vary within the range from 3 to 50 weight percent. By changing the size of openings in the screen plate, it is possible to influence the size of fractions separated from the raw material.

At the end of the frame 20, the material is sucked into a channel 25, and it is blown by a blower along a channel 26 to the levelling apparatus.

Figure 7 shows a levelling apparatus intended for ultimately levelling out variations occurring in the material flow in the longitudinal direction. The material consisting of fibres and wood splinters is passed into a channel 26 extending in a slanted position above shafts 27 of different heights. Material falls from the channel into the shafts 27, and it is fed by separate distributing devices, such as sets of rollers 28, placed at the bottom of each shaft 27 and having advantageously an adjustable feeding rate, to a conveyor 29 running underneath them. From the end of the conveyor 29, the material is led through a channel 30 to product formation shown in Fig. 8. The heavier fraction falls at the first stage to a first shaft (first shafts) 27a. In a corresponding manner, the lightest fraction, *i.e.* the fluffiest fraction, falls first to the later shafts or the last shaft 27b. In this way, the material flow, supplied through the channel 26 and being non-homogeneous in relation to time, is divided into

shafts 27, from which a material flow which is homogeneous in relation to time and contains a desired distribution of fractions of different weights, can be taken onto the conveyor 29. The desired fraction group is led through a channel 30 to further processing.

Figure 8 shows an apparatus for the product formation step. The air flow blown along the channel 30 and carrying the fibres, wood splinters and blend fibres, is supplied by a feeding device 31 into a forming chamber 32 which is closed by a forming platform 33 moving in relation to the chamber and passing the air through. The air flow carrying material to the formation point on top of the platform is sucked into a chamber 34 on the other side of the platform. At this point, it is possible to manufacture a planar product having the final basis weight. The product can be compressed at a later stage according to the final density desired for the product. These mat-like or sheet-like products can vary from porous mat-like flexible products into stiff plates. Simultaneously with compression, thermal binding is conducted, if the blend fibres are heat-activated fibres, such as thermoplastic fibres which are softened by the effect of heat into a gluing state and bind the structure when cooling down.

The mat-like product formed on the forming platform can also be an intermediate or semi-fabricated product, which is later subjected to pressing to shape, wherein it will receive a shape deviating from the planar surface, *i.e.* it will be manufactured into a shaped piece deviating from a planar product. Also in pressing to shape, the binding properties of blend fibres can be utilized by heating and cooling.

Even if the product were not pressed or compressed, blend fibres can be utilized in the product so that they form a kind of network or "cage" surrounding the components of the vegetal raw material and holding the material (fibres and wood splinters) in place.

The invention is not limited solely to the use of a heat-activatable blend fibre for binding the product, but the fibres and small wood splinters can be bound together also by other binding agents.

The invention is suitable for the use of all flax species and varieties containing basic fibre and woody material in their stalks, but it can also be applied in the treatment of other stem fibre plants with a similar structure. The invention can also be applied directly to a flax which is stored after cutting into an intermediate depot, particularly in bales; in other words, no complicated pre-treatment steps, such as retting, are required.

Claims:

1. Fibre product manufactured of flax or a corresponding stem fibre plant, **characterized** in that it constitutes a structural element containing both actual fibres of the stalk and wood splinters or shives originating from the same plant raw material and incorporated in the product by crushing the structure of the stalk to a sufficient degree.

2. Product according to Claim 1, **characterized** in that it contains, besides components originating from the stalk, also blend fibres.

3. Product according to Claim 1, **characterized** in that the blend fibres are synthetic bond fibres.

4. Product according to Claim 3, **characterized** in that the content of synthetic bond fibres is 3 to 50 wt-%, advantageously 5 to 15 wt-%.

5. Product according to any of the Claims 1 to 4, **characterized** in that it is a pressed-to-shape structural element.

6. Product according to any of the Claims 1 to 4, **characterized** in that it is a porous product, such as an insulating material or a cultivation substrate.

7. Method for manufacturing a fibre product from flax or a corresponding stem fibre plant, **characterized** in that the stalks of the plant are crushed to an extent that its fibres and woody splinters or shives are at least partly separated, whereafter the same product is composed of both of the said components.

8. Method according to Claim 7, **characterized** in that it comprises the following steps:

a) mechanical crushing of stalks,

b) working up of the crushed stalks between surfaces moving in relation to each other so that the fibres and wood splinters are separated and mixed,

c) separating fine particles from the fibres and wood splinters,

d) transferring the fibres and wood splinters with a medium to a forming platfom to form at least a pre-fabricate incorporating fibres and wood splinters in the same structure.

9. Method according to Claim 8, **characterized** in that at a suitable stage before the forming platform, synthetic bond fibres are mixed with the fibres and wood splinters.

10. Method according to any of the preceding Claims 7 to 9, **characterized** in that the product is formed onto a forming platform by a dry method using an air flow or the like.

11. Method according to any of the preceding Claims 7 to 10, **characterized** in that the structure consisting of fibres and wood splinters is pressed to shape into a substantially stiff product.

12. Method according to any of the preceding Claims 7 to 10, **characterized** in that the product formed on a forming platform is fabricated into a mat-like final product with a substantially even thickness.

13. Apparatus for manufacturing a fibre product, **characterized** in that the crushed fibre product is arranged to be led into a channel (26) or the like, whereby shafts (27, 27a, 27b) for receiving different fractions of the fibre product are positioned underneath the channel (26), and that each shaft (27, 27a, 27b) comprises a distributing device (28) for discharging the fraction group contained in each shaft (27, 27a, 27b) from the shaft.

14. Apparatus according to Claim 13, **characterized** in that a conveyor (29) or the like is arranged in connection with the shafts (27, 27a, 27b) by which conveyor (29) or the like the fraction groups to be discharged from the shafts (27, 27a, 27b) are arranged to be transported to product formation.

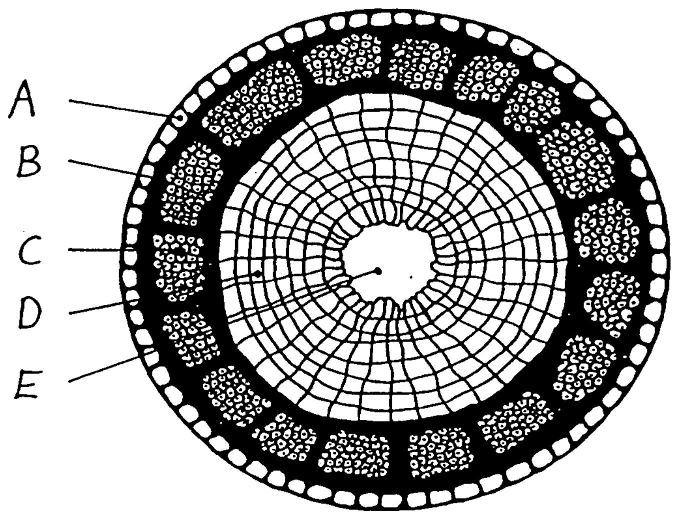

Fig. 1

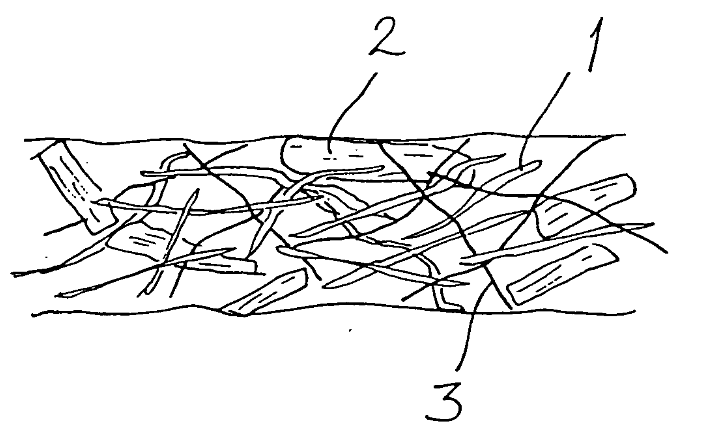

Fig. 2

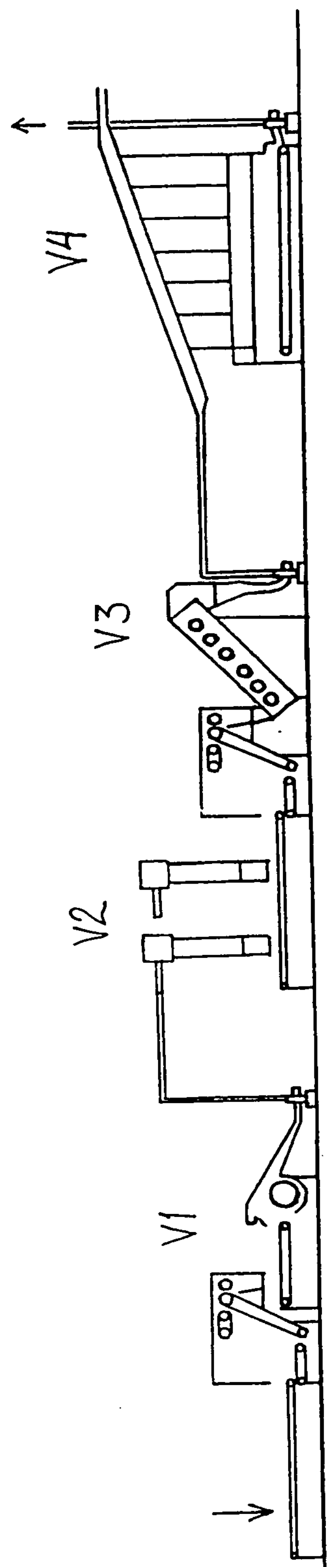

Fig. 3

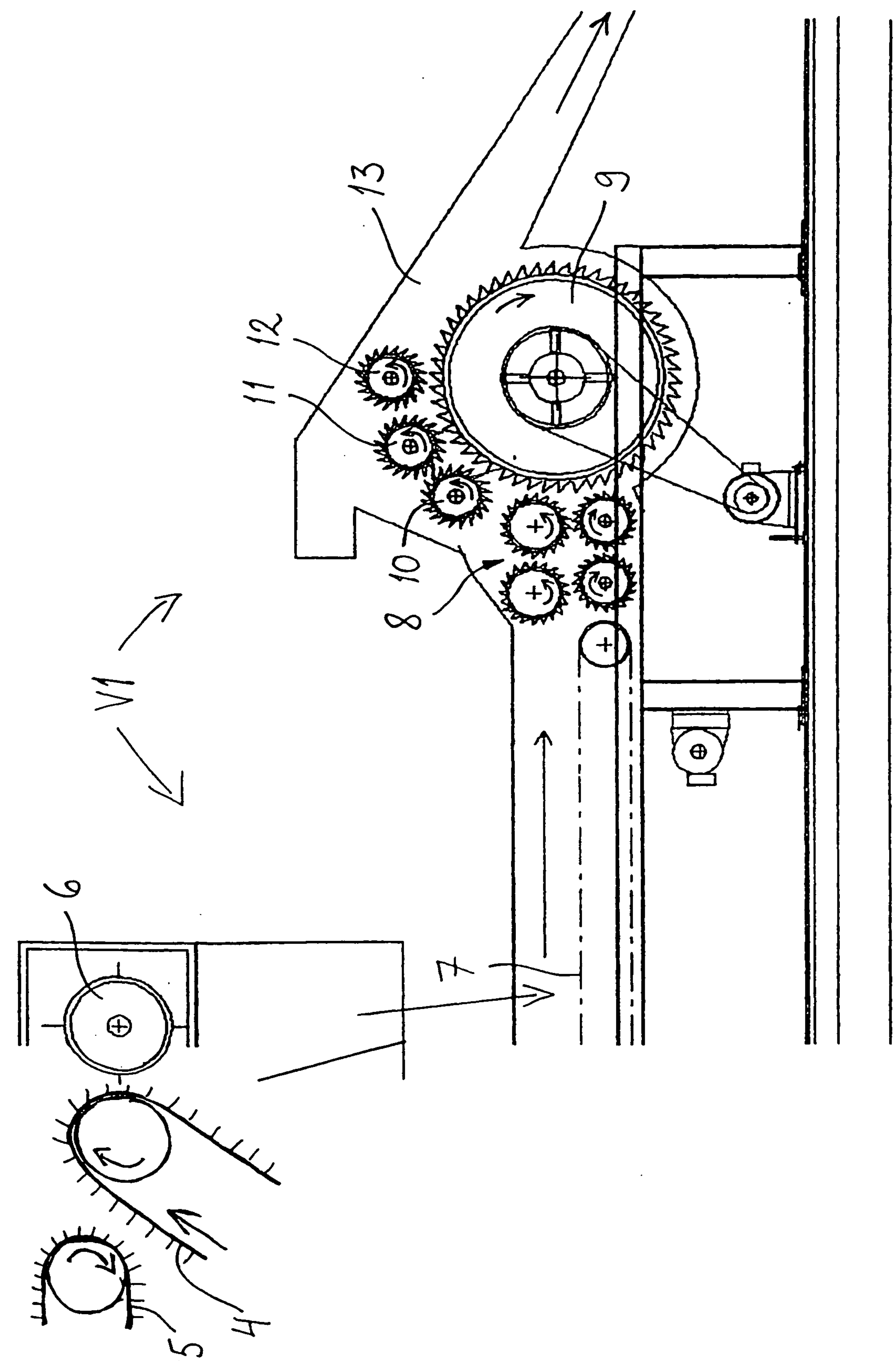

Fig. 4

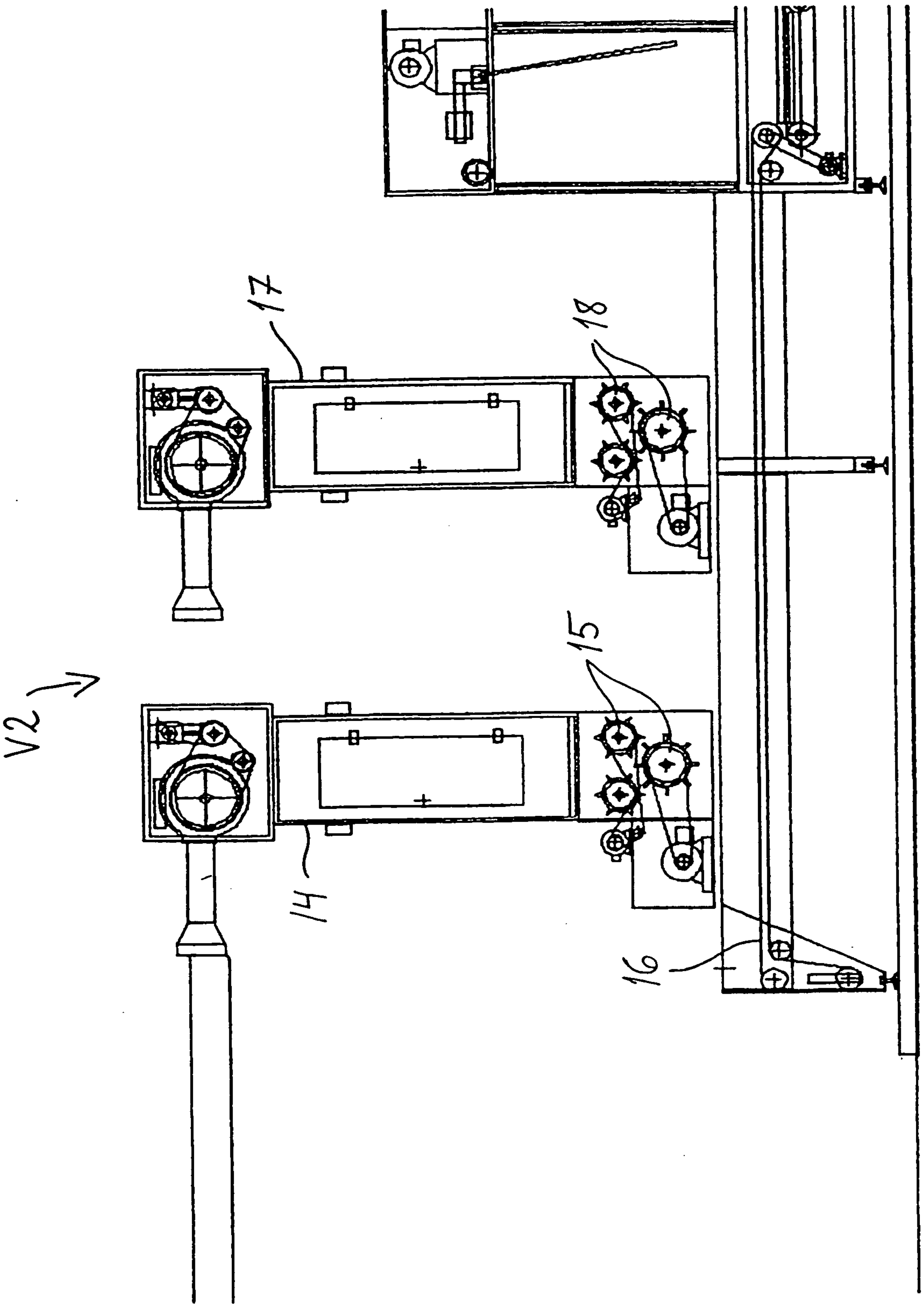

Fig. 5

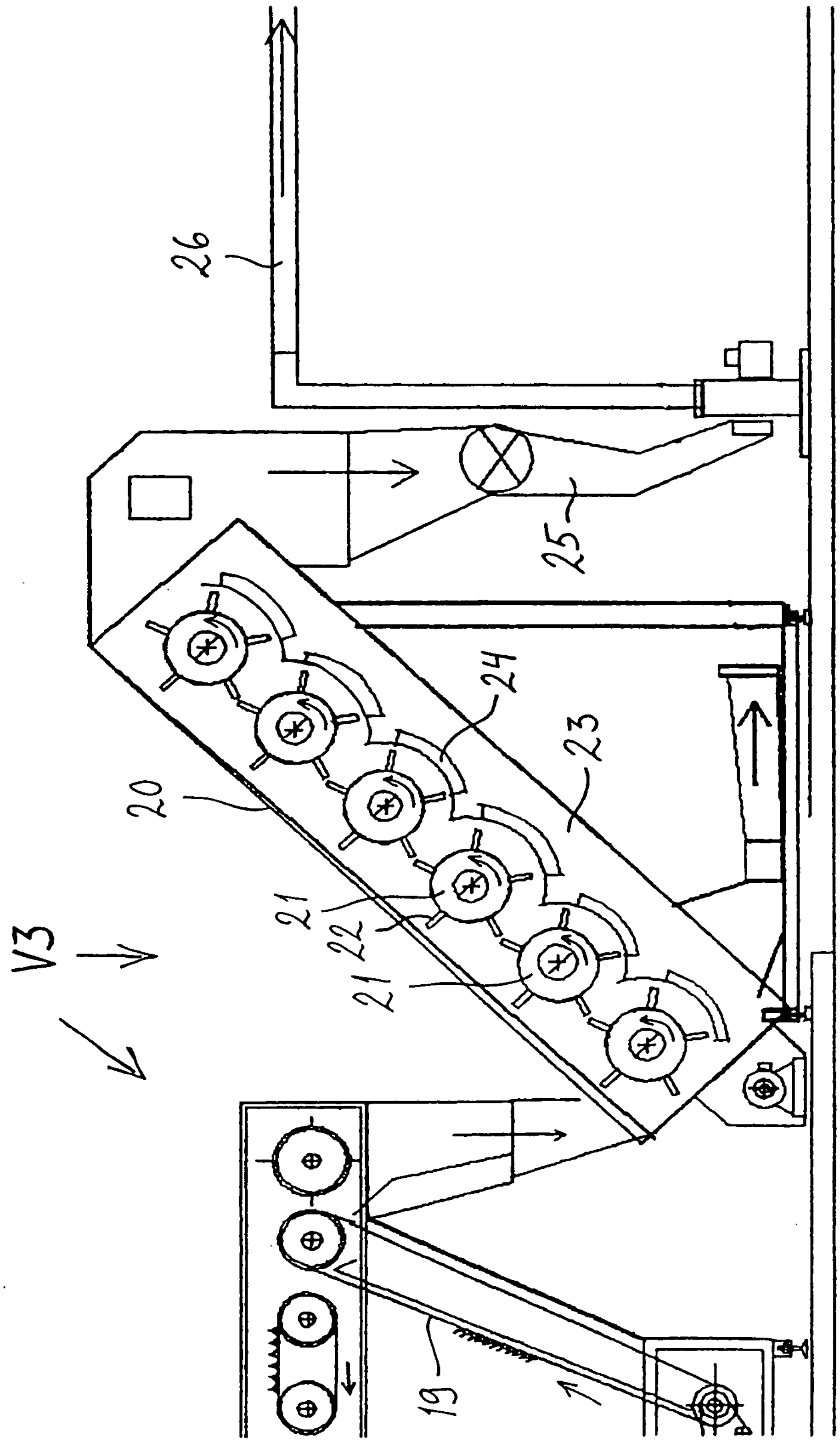

Fig. 6

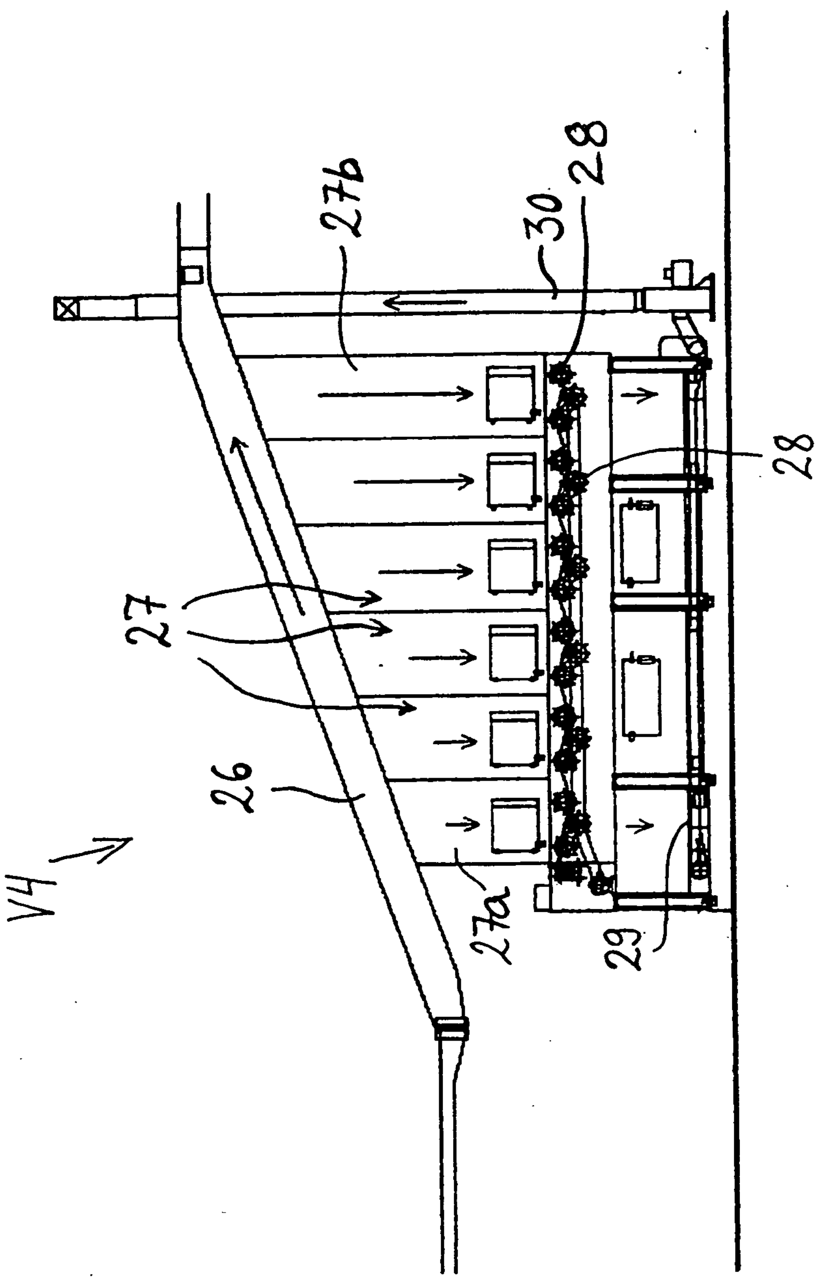

Fig. 7

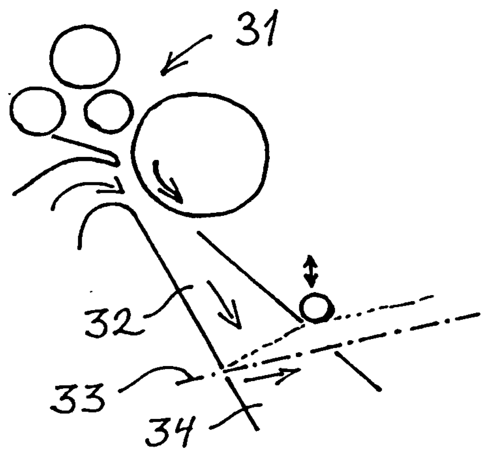

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 97/00415

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D04H 13/00, A01G 9/10, E04B 1/76
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPAT, CLAIMS, JAPIO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 2117918 A (TECHNISCH ONTWIKKELINGSBUREAU VAN ELTEN N.V.), 8 June 1972 (08.06.72), figures 1-4, claim 1	1,7,13
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Y	DE 4230990 A1 (SULEIMAN, RATEB), 19 May 1993 (19.05.93), figures 1,2, abstract	1,7,13
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A	DE 3815771 A1 (CLAAS SAULGAU GMBH), 23 November 1989 (23.11.89), figure 1, abstract	13
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
11 December 1997	12 -12- 1997

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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0398421 A1 (INSTITUUT VOOR BEWARING EN VERWERKING VAN LANDBOUWPRODUKTEN), 22 November 1990 (22.11.90), abstract, figures	13

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INTERNATIONAL SEARCH REPORT
Information on patent family members

04/11/97

International application No.
PCT/FI 97/00415

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2117918 A	08/06/72	AT 303333 A	15/10/72
DE 4230990 A1	19/05/93	NONE	
DE 3815771 A1	23/11/89	BE 1004204 A	13/10/92
		FR 2631045 A	10/11/89
EP 0398421 A1	22/11/90	NL 8901226 A	17/12/90